# SECTION 1. INTRODUCTION

This report provides a summary of the findings from a three phase project for work related to the Watts Branch Watershed Study and Management Plan project. Phase I of the project was largely devoted to data collection and analysis of both historic and existing conditions. In Phase II, the project team prepared conceptual designs, cost estimates and analyses of estimated benefits for specific watershed management measures such as stormwater management retrofits, stream rehabilitation, wetland enhancement, and forest conservation. In Phase III, the final phase, the project team developed management recommendations for public outreach and education, bench mark and long term monitoring, and prioritization of implementation. Recommendations have been formulated with respect to watershed management approaches aimed at reducing and mitigating many of the adverse impacts that the watershed has experienced over the course of urbanization. The major sections of this report include:

- Introduction and Background
- Current Watershed Conditions
- Stormwater Retrofit Opportunities
- Stream, Wetland, and Forest Rehabilitation Opportunities
- Watershed Management, Public Outreach and Education, and Watershed Indicator Monitoring Recommendations

## 1.1 Why Watersheds?

Urbanizing communities frequently find that their water resources are degrading in response to growth and development. They are also discovering that they can only protect these local water resources by thinking on a watershed level. Watersheds are important to any community because they embody our sense of place in the landscape, and their waters are important in our daily life. Some of the many interactions between ourselves and urban watersheds are described below in Table 1.1. In an important sense, watersheds are the geographic address for our community, and provide a common and unifying goal to rally around.

**Table 1.1 Some of the Important Aspects of Watersheds and Urban Streams**

| In Our Daily Life | Where We Recreate | In the Natural Ecosystem |
|---|---|---|
| drinking water | fishing | food chain |
| food (shellfish, fish) | swimming | habitat |
| kids playing in creek | boating | migratory stop-overs |
| property drainage | hiking trails and greenways | |
| flooding and erosion | bird watching | |

Communities find many reasons to protect local watersheds--whether it is because of economic benefits, recreation, flood prevention, scenery or the overall quality of life. Different groups of people often have their own unique rationale for protecting watersheds. Some may place a high value on the aquatic biological community living in these waters, while others will be more concerned about reducing stream channel erosion to the real estate in their back yard. Regardless of the reasons, it is clear that most communities now recognize the value of local watershed protection. Watts Branch is no different in this sense. The Watts Branch watershed serves as an important focal point and community attraction for the City of Rockville. With its established park land, recreational centers, and foot trails, the watershed provides both active and passive recreational opportunities. However, with development that has occurred over the last 40 to 50 years in the watershed, increasing pressure has been placed on this resource. In many locations, the stream has eroded and degraded to the point where habitat and recreational functions have been severely limited or altogether lost.

The primary objective of the Watts Branch watershed project is to develop a comprehensive watershed rehabilitation and protection plan that will establish an implementation program aimed at mitigating many of the impacts and stresses that exist on the ecosystem. Through implementation of the proposed mitigation measures, it is hoped that many of the existing benefits associated with the watershed will be protected and that many of the lost or impaired uses will be restored to both the natural and built environment. Specific watershed protection goals of the plan include:

- Minimize/control channel enlargement (i.e., channel erosion)
- Reduce pollutant loadings from nonpoint source runoff
- Develop stewardship among residents by educating and changing behaviors and building interest in the watershed
- Protect existing utilities in and near streams from erosion damage
- Provide effective stormwater management control over a significant proportion of the watershed (or subwatershed)
- Protect existing forest areas
- Protect existing wetlands
- Protect existing active recreational areas

Watershed management often must balance competing interests to achieve a net environmental benefit for the watershed. This study attempted to accomplish this by objectively weighing the various recommendations and opinions offered during the planning process. In the end, the management plan and priority recommendations reflect a process of consensus building and compromise reaching that has strived to optimize the ability to meet the watershed goals while causing the minimum amount of disruption.

## 1.2 Rockville's Stormwater Management Program

The City of Rockville began its stormwater management program for new development in 1978. Today, the City requires all new development to meet recently adopted state guidelines for water quality and quantity treatment. The City's Stormwater Management law (Chapter 19 of the City Code) and the Department of Public Works' Stormwater Management Regulations describe the requirements for new development, which is administered through the City's development review and permitting process. Smaller projects may qualify to use the City's Regional stormwater management Participation program in lieu of on-site stormwater management facilities, if on-site stormwater management is impractical or infeasible. The Regional Participation Program accepts off-site stormwater management, stream improvements or monetary contributions which help the City provide public watershed improvements throughout the City.

The watershed management plans are intended to address current deficiencies in stormwater management and stream protection caused by previous development. The Watts Branch Watershed Management Plan is the third done by the City for its watersheds. The Cabin John Watershed Study, covering southern Rockville, was adopted in 1995, and a number of the recommended stormwater management facilities and stream restoration projects have been implemented. The Rock Creek Watershed Management Plan, adopted in 2000, recommended mostly stream restoration projects for the highly urbanized eastern part of Rockville, although stormwater management retrofits were included where space was available.

The Department of Public Works is responsible for watershed studies, stormwater management, correction of stream erosion problems, and storm drain conveyance, in addition to the public water, sewer and road infrastructure in the City. The City implements public watershed improvements through the Capital Improvements Program with money from the Stormwater Management Fund. The same mechanism is used to provide inspections and maintenance for existing public stormwater management facilities.

## 1.3 Watershed Characterization and History of Development Patterns in Watts Branch

It is helpful to have a general understanding of some of the major characteristics of the Watts Branch watershed (e.g., size, location, population, land use, percent impervious, etc.) to help provide context for the technical analyses and management recommendations presented in subsequent sections of this report. The following discussion provides background information on key watershed characteristics as well as a chronological summary of development in the watershed.

Watts Branch is an approximately 22 square mile tributary to the Potomac River (see Figure 1.1). The confluence of the Potomac River and Watts Branch is of particular importance due to the fact that it is just upstream of a major Washington Suburban Sanitary Commission drinking water intake for suburban Maryland; consequently, the water quality of Watts Branch can have a significant impact on the level of treatment required at the drinking water plant. Historic observations have indicated that during and just after storm events, a higher level of treatment than normal is required at the plant due to the increased sediment load from Watts Branch (and possibly other nearby upstream tributaries). Watts Branch is also tributary to the Chesapeake

Bay, where nutrient and sediment load reduction is a major basin goal for the Bay. In fact, last June, the Chesapeake Executive Council (which includes the governors of Maryland, Pennsylvania, Virginia, the District of Columbia Mayor, the EPA administrator and Chesapeake Bay Commission chairman) signed the Chesapeake 2000 Agreement, which calls for cleaning up the Bay by 2010. To do that, new nutrient (and, for the first time, sediment) goals will be set by the end of 2001. The cleanup gained urgency in 1999, when the EPA placed the Bay on its list of "impaired" waters because it does not meet water quality standards that support the needs of those "living resources." Unless it attains those standards by 2010, the region will have to develop a detailed, enforceable cleanup plan known as a Total Maximum Daily Load (TMDL) (ACB, 2001). Therefore, limiting the nutrient loads from Watts Branch will assist in achieving the larger basin goal of the Chesapeake Bay.

The Watts Branch watershed within the City of Rockville is approximately 6.5 square miles, and includes the vast majority of first and second order streams in the watershed as a whole. A stream reach numbering convention was established to facilitate the rapid field assessments that were conducted as well as the analysis of smaller subwatersheds. The numbering convention used to identify reaches is based on the order of the stream (e.g., first order through fourth order). For example, there is one fourth order reach consisting of the main stem of Watts Branch (i.e., 401), two third order reaches (i.e., 301 and 302) also considered as the main stem, six second order reaches and so on. Stream reaches were numbered in a clockwise direction starting at the most downstream point and starting with first order streams. For subwatershed analysis, the numbering convention used is based on the highest (i.e., largest) order stream within the delineated subwatershed. For example, the southwestern most subwatershed is comprised of stream reaches 101, 102, and 201. Therefore, the subwatershed identification number is 201. A total of ten subwatersheds were delineated for subwatershed analysis. Figure 1.2 illustrates these naming conventions for the reaches and subwatersheds and Table 1.2 provides a summary of some key subwatershed characteristics.

**Figure 1.1 Vicinity Map for Watts Branch Watershed (Source: Microsoft™ Expedia Streets 98)**

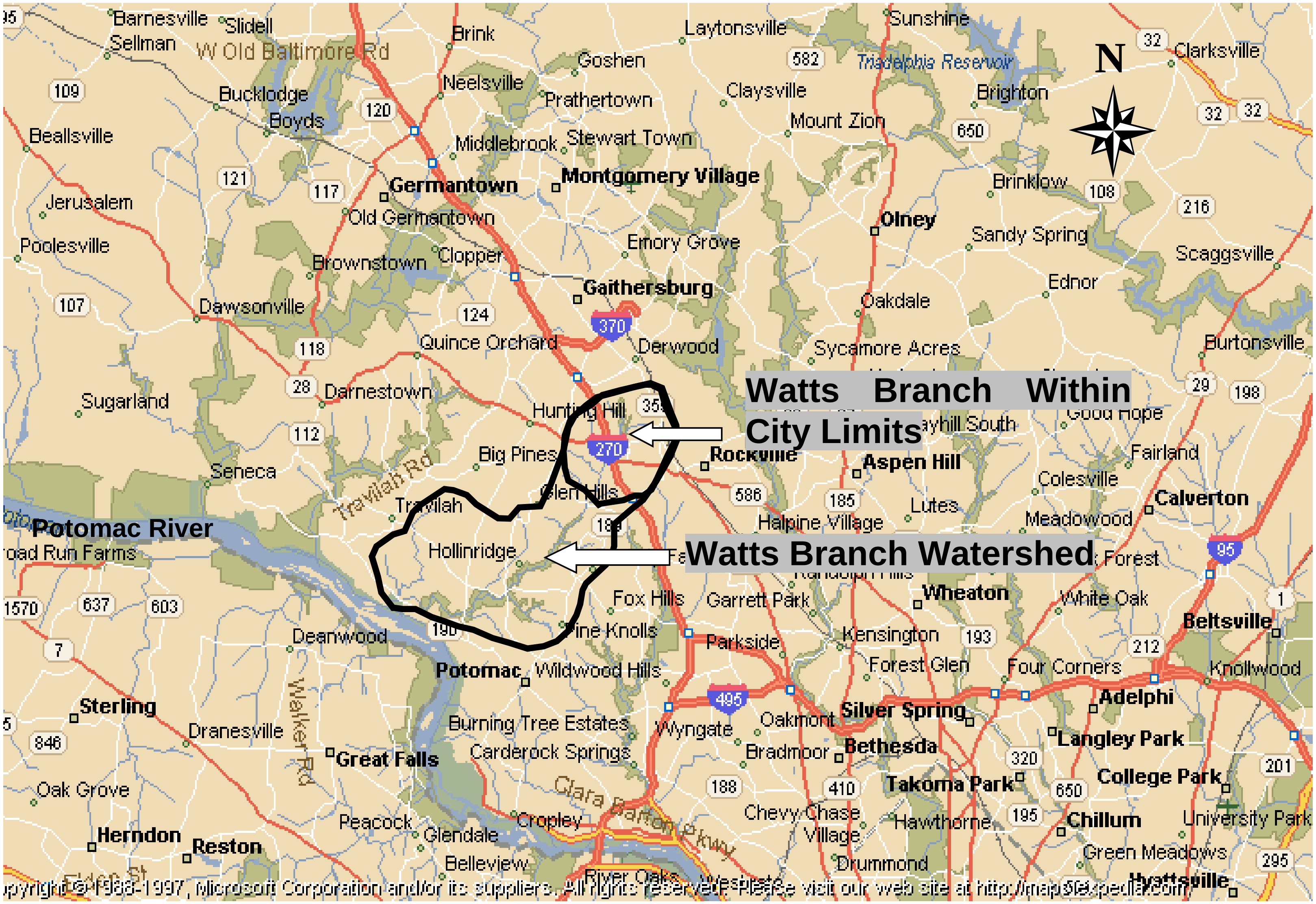


**Table 1.2 Watts Branch Subwatershed Characteristics**

| Subwatershed ID | Area (Acres) | Stream Miles | Approx. Imp. Cover (%) | Predominant Land Use |
|---|---|---|---|---|
| 201 | 336 | 1.4 | 20 | institutional, golf course |
| 103 | 285 | 0.7 | 30 | medium density residential |
| 301 | 735 | 4.1 | 25 | agricultural, office/commercial |
| 204 | 389 | 2.3 | 30 | office/commercial, residential |
| 205 | 407 | 2.5 | 30 | residential, mixed use |
| 114 | 159 | 0.4 | 50 | high/med. density residential |
| 115 | 283 | 0.8 | 30 | med. density res., institutional |
| 115A | 165 | 0.9* | 30 | med. density res., institutional |
| 206 | 540 | 2.2 | 28 | med. density res., institutional |
| 119 | 184 | 0.4 | 28 | medium density residential |
| Mainstem | 677 | 3.5 | 28** | residential, mixed use |

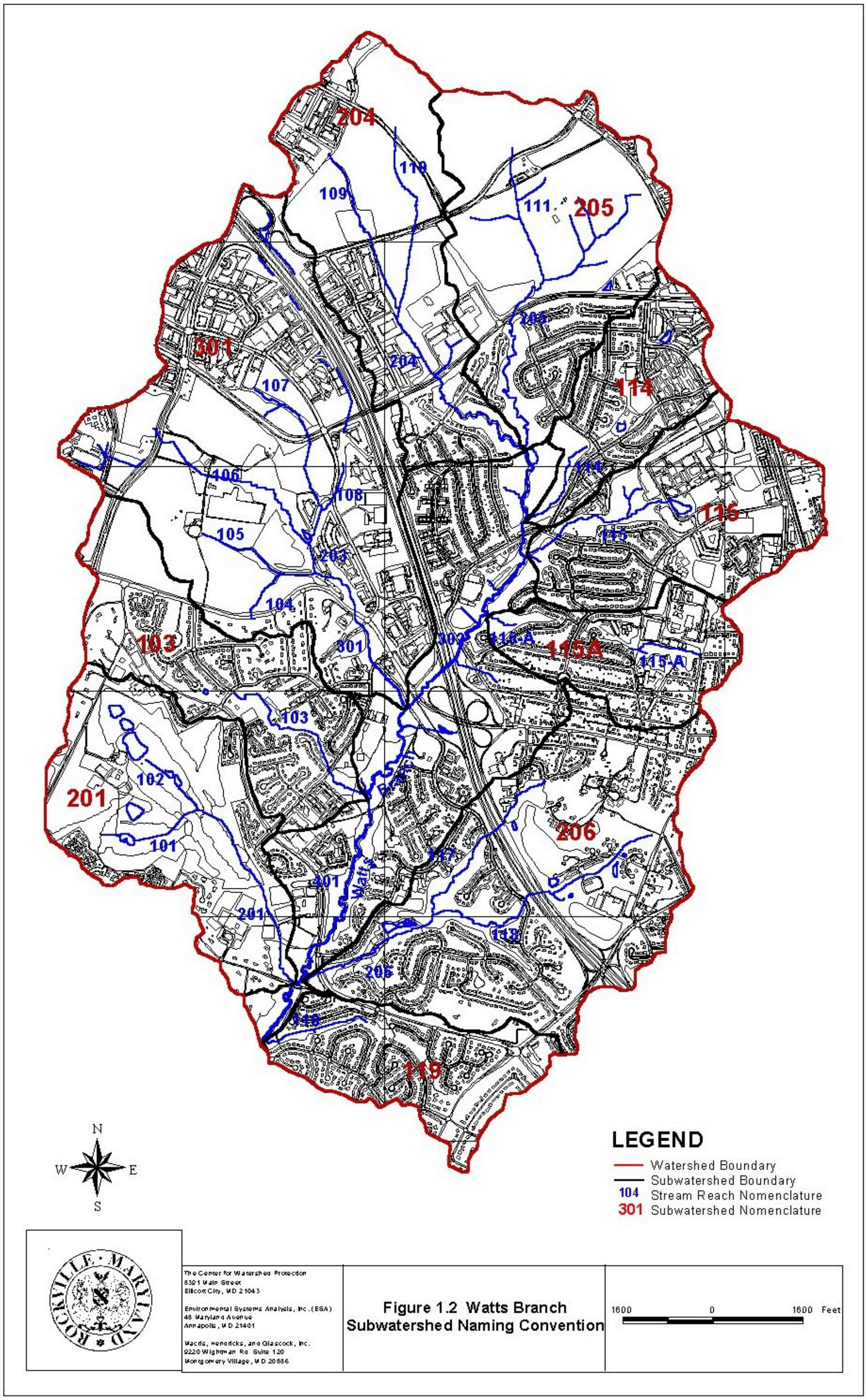
* Includes approximately 0.5 miles of piped channel

** Estimated based on visual inspection and comparison with other subwatersheds

In general, the mainstem of Watts Branch flows from north to south. The current (i.e., 1999) imperviousness of the Watts Branch watershed within the City of Rockville limits is approximately 28 percent. Based on the management classification scheme developed by the Center for Watershed Protection (1998), Watts Branch falls into the "Non-supporting" or "Restorable" watershed categories. This is important in that it helps define realistic expectations of what current watershed conditions are as well as what the prospects are for improvement in response to mitigation and rehabilitation efforts.

Of the approximately 18.7 miles of stream within the City, roughly 37% or 7 miles lie within City Department of Recreation and Parks ownership. This fact demonstrates the importance of working closely with the Recreation and Parks department to achieve multiple objectives with proposed retrofits and stream restoration projects and for working towards an efficient implementation plan.

**Figure 1.2 Watts Branch Subwatershed Naming Convention**



Existing water quality and macroinvertebrate data tend to support the classification of Watts Branch as "Non-supporting" or "Restorable" stream. A 1997 report by EA Engineering Inc. summarizes the available historic water quality and macroinvertebrate data for Watts Branch. Watts Branch water quality is characterized as good to excellent in the early 1970s; however, by the mid to late 1990s, the data reflect fair to poor water quality. Of particular note is the observed decline in water quality in the upper reaches of Watts Branch, possibly attributed to agricultural runoff and subsequent development of the King Farm parcel, Piccard Drive office buildings, and I-270 widening. Similar to the water quality data, the existing benthic macroinvertebrate data suggest that there has been a general decline in the diversity and richness of species, with most recent sample points being described as poor.

A factor contributing to the declining water quality and macroinvertebrate community in the Watts Branch watershed is urbanization (see discussion in Section 1.5). With the current and planned development of the last two significant parcels of contiguous land (King Farm and Thomas Farm), the Watts Branch watershed will be essentially built-out. The land use within the watershed is comprised of a mixture of residential, commercial, and institutional. Of these, the predominant land use is single family residential (see Figure 1.3).

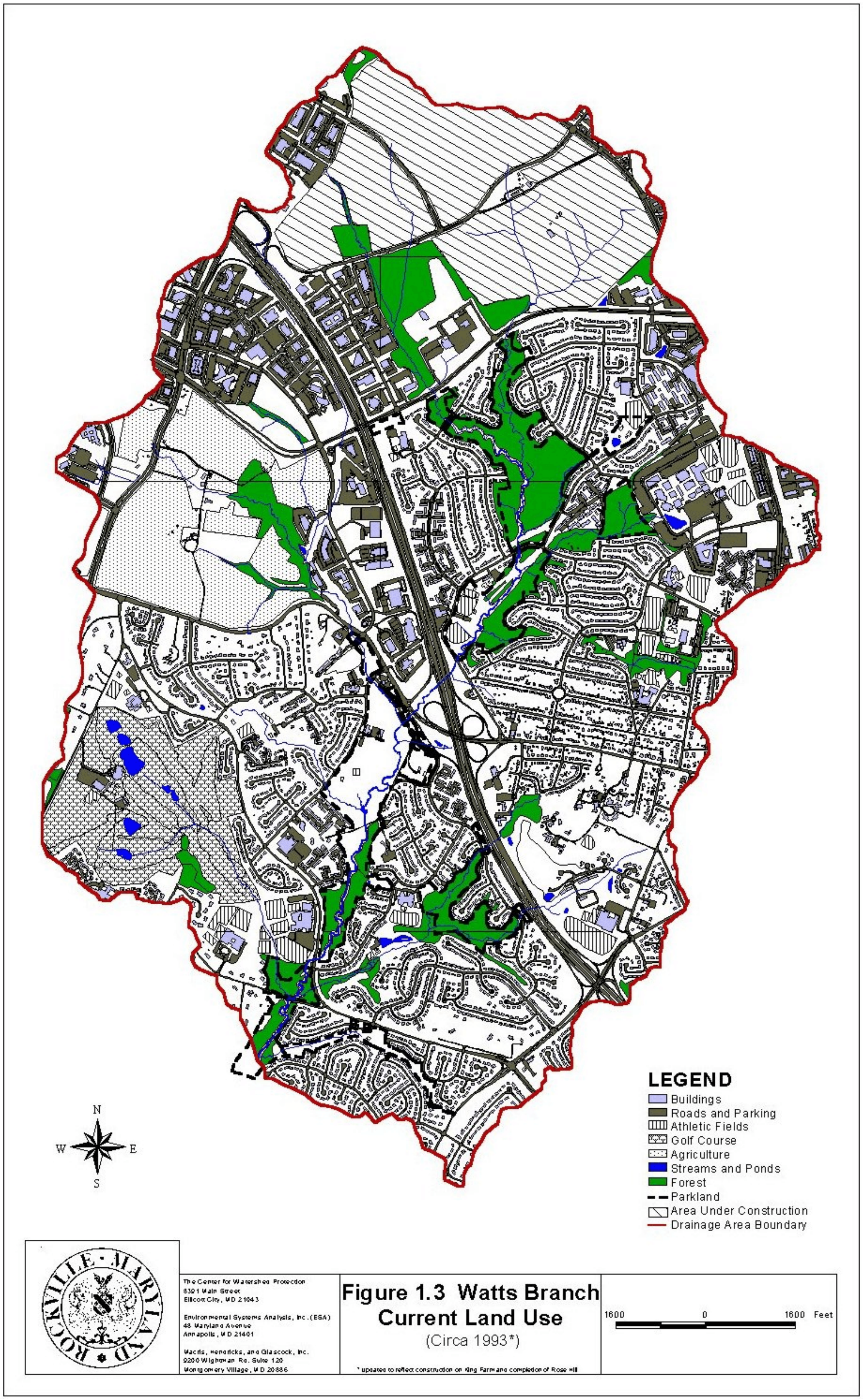
The development patterns in Watts Branch over the last century can be roughly broken out into the following five eras during which notable trends occurred or specific areas were targeted for buildout:

- Pre World War II
- Post World War II - 1960
- 1960 - 1970
- 1970 - 1990
- 1990 - present

*Pre World War II*
Development prior to World War II was generally limited to the West End (the W. Montgomery Avenue corridor and nearby vicinity). Much of this development dated to the Victorian era (c. 1870 - 1890). The land use prior to World War II was predominantly agriculture and forest.

*Post World War II - 1960*
Post World War II development saw the construction of much of the Woodley Gardens project. With these residential areas came construction of sanitary sewer trunk mains along/parallel to Watts Branch. Major transportation projects were also built in this era, with the original construction of I-270 (circa 1957-1959) as a 4-lane interstate with two interchanges, one at Rt. 28 (near the mainstem of Watts Branch) and the other at Shady Grove Road (at the northern watershed boundary near the headwaters of Watts Branch). It is also of note that an effort was made to preserve large contiguous tracts of forest cover and park lands along and adjacent to the mainstem of Watts Branch (e.g., Woodley Gardens Park) during this era.

**Figure 1.3 Watts Branch Current Land Use**



*1960 - 1970*
During the 1960s, additional residential development occurred northeast of I-270 and north of Watts Branch in College Gardens and in an area known as Rockville Estates, now considered part of Woodley Gardens. Similar to the previous era, this development occurred without consideration of stormwater management. Additional commercial development also occurred with construction of office parks on either side of I-270 along Piccard Drive and Research Boulevard.

*1970 - 1990*
This era showed the advent of early stormwater quantity management, with single family residential development southwest of I-270 in the Rockmead, Rockshire, and Fallswood areas. In addition, office park development continued along Piccard Drive and Research Boulevard. Major transportation projects included construction of the first part of Wootton Parkway in the early 1970s and widening of I-270 to 12 lanes and the addition of a third interchange within the Watts Branch watershed at Falls Road. Basic erosion and sediment controls and stormwater management controls were implemented during this era.

*1990 - present*
In the last decade, development has consisted of small infill projects as well as planning of the last two significant parcels of farm land, King Farm and Thomas Farm (renamed Fallsgrove). These parcels are or will be developed as mixed use parcels. In addition, transportation-related projects have included the widening of Rt. 28 and the extension of Key West Avenue. Once development of the Fallsgrove and King Farm parcels is complete, the Watts Branch watershed will essentially be fully built-out and urbanized.

At the same time of this study's field work in 1999, major development activity included construction at King Farm on Phases 1, 2, and 3; mass grading at King Farm started in 1996. The Rose Hill residential construction was also underway in 1999. Fallsgrove did not break ground until 2000, after this study's field work was concluded.

## 1.4 Watts Branch Geomorphic History

The Watts Branch watershed is somewhat unique in that it is a rare example of a watershed that has been scientifically studied over time. The renowned fluvial geomorphologist, Dr. Luna Leopold, had the foresight to study the Watts Branch watershed in an attempt to establish a database from which to track and analyze changes in small headwater stream channels. At the outset, Leopold believed that the results of his work would be of interest to the generation of his grandchildren. He quickly realized, however, that the changes he observed occurred far more rapidly than he had expected (Leopold, 1973).

Leopold surveyed approximately 14 monumented cross sections along the main stem of Watts Branch in the vicinity of Woottons Mill Park every other year over a 20 year period (1953-1972). Figure 1.4 is a photograph of the area studied in the late 1950s. As can be seen, this reach of Watts Branch was largely in an agricultural setting.

**Figure 1.4 Historic photo (circa late 1950s) of Leopold investigation site**

The initial purpose of Leopold's investigation was to describe the process and rate of lateral migration of the stream channel, the construction of point bars and flood plain, and the effects of meander curves on the process and rate of migration. An unintended result of Leopold's research was quantitative data on the effects of progressive urbanization in a small watershed (the contributing drainage area to the majority of Leopold's study points was approximately 3.7 square miles). During the first decade of observation, Leopold noted a decrease in channel cross sectional area. He attributed this, in part, to the sediment being generated and deposited from upstream urbanization. As the urbanization within the watershed intensified in the 1960s (coinciding with Leopold's second decade of observation), the channel reversed its form, going from contraction to enlargement.

As this report documents, the enlargement trend that Leopold observed in Watts Branch has continued through the 1990s, and can be directly related to the degree and rate of urbanization. The adverse impacts associated with the channel enlargement are a major reason for this watershed planning effort. Having access to Leopold's detailed, historic data provides an important validation for the analyses performed as part of this project.

## 1.5 Impacts of Urbanization and the Influence of Impervious Cover on Stream Quality

The process of urbanization has a profound influence on the hydrology, morphology, water quality, and ecology of surface waters. Impervious cover is an important indicator with which to measure the impacts of land development on aquatic systems. Numerous scientific studies have documented the relationship between impervious cover and overall stream health. Much of the technical analysis performed for this watershed project uses impervious cover directly or indirectly to quantify and develop specific mitigation strategies for both instream rehabilitation efforts and stormwater management retrofit conceptual design.

The discussion presented below provides specific detail about some of the key changes in urban streams due to increases in impervious cover levels.

<u>Surface runoff during storm events dramatically increases</u>. Depending on the degree of impervious cover, the annual volume of stormwater runoff can increase by 2 to 16 times its predevelopment rate, with proportional reductions in groundwater recharge (Schueler, 1994). Research by Leopold (1994) shows that the average annual flood increased from 781 cfs during the period of 1958-1973 to 959 cfs during the period of 1973-1987. This represents a 23 % increase in peak discharge.

<u>Bankfull and sub-bankfull floods increase in magnitude and frequency</u>. The peak discharge associated with the bankfull flow (i.e., the 1.5 to 2 year return storm) increases sharply in magnitude in urban streams. In addition, channels experience more bankfull and sub-bankfull flood events each year, and are exposed to critical erosive velocities for longer intervals (Hollis, 1975; Booth *et al.*, 1996; and MacRae, 1996). Leopold (1973) found that over a 12 year period from 1958-1969, the frequency of flows exceeding the Watts Branch channel capacity increased by roughly a factor of 4 and that the frequency of large out of bank events (i.e., 1,000 cfs) increased dramatically as well.

<u>Channels enlarge</u>. The customary response by an urban stream is to increase its cross-sectional area to accommodate the higher and more frequent erosive flows. This is done by stream bed down-cutting, stream bank widening, or a combination of both. Urban stream channels often enlarge their cross-sectional area by a factor of two to ten, depending on the degree of impervious cover and the age of development in the upland watershed (Caraco, 2000; Arnold *et al.*, 1982; Gregory *et al.*, 1992; and MacRae, 1996).

<u>Stream channels are highly modified by human activity.</u> Urban stream channels are extensively modified in an effort to protect adjacent property from streambank erosion or flooding and to cross the streams with bridges and culverts. Headwater streams are frequently enclosed within storm drains, while others are channelized, lined, and or “armored” by heavy stone. Another modification that is unique to urban streams is the installation of sanitary sewers underneath or parallel to the stream channel. According to May, *et al.* (1997), 20 to 30% of natural stream channels are modified in typical urban watersheds.

<u>Instream habitat structure degrades</u>. Urban streams are routinely scored as having poor instream habitat quality, regardless of the specific measure or method employed. Habitat degradation is often exemplified by a loss of pool and riffle structure, embedding of stream substrate sediments, shallow depths of flow, eroding and unstable banks, and frequent stream bed dislocation.

Stream crossings and potential fish barriers increase. Many forms of urban development are linear in nature (e.g., roads, sewers, and pipelines) and cross stream channels. The number of stream crossings increases directly in proportion to impervious cover (May *et al.,* 1997), and many crossings can become partial or total barriers to upstream fish migration, particularly if the stream bed erodes below the fixed elevation of a culvert or a pipeline. On the Watts Branch mainstem alone, there are at least eight major crossings. Many more exist on the tributaries.

Riparian forests become fragmented, narrower and less diverse. The important role that riparian forests play in stream ecology is often diminished in urban watersheds, as tree cover is often partially or totally removed along the stream as a consequence of development (May *et al.*, 1997). Even when stream buffers are reserved, encroachment often reduces their effective width, and native species are supplanted by exotic, non-native trees, vines and ground covers.

Water quality declines. The water quality of most urban streams during storm events is consistently poor. Urban stormwater runoff contains moderate to high concentrations of sediment, carbon, nutrients, trace metals, hydrocarbons, chlorides and bacteria (Schueler, 1987). While considerable debate exists as to whether stormwater pollutant concentrations are actually toxic to aquatic organisms, researchers agree that pollutants deposited in the stream bed exert an undesirable impact on the stream community.

Reduced aquatic diversity. Urban streams are typified by fair to poor fish and macroinvertebrate diversity, even at relatively low levels of watershed impervious cover or population density. The ability to restore pre-development fish assemblages or aquatic diversity is constrained by a host of factors: irreversible changes in carbon supply, temperature, hydrology, lack of instream habitat structure, and barriers that limit natural recolonization. Watts Branch confirms this generalization as exhibited by monitoring results from Montgomery County's Stream Protection Strategy (CSPS). Specifically the 1996 data report "fair" (based on a scale of excellent, good, fair, and poor) fish diversity and fair to poor macroinvertebrate diversity.

## 1.6 Rapid Watershed Approach

Because impervious cover is a good indicator of stream health, coupled with the fact that it is a parameter that is fairly easy to measure on a watershed basis, it is a good management tool in the watershed planning and protection process. Under the rapid watershed planning approach advocated by the Center, the impervious cover model is used to provide a preliminary diagnosis of stream health along with a suite of management options based on realistic expectations of what can be achieved in a given watershed. The model identifies three general stream types based on impervious cover ranges and offers general recommendations for planning goals and objectives. The three stream types are: sensitive streams (0-10% imperviousness); impacted streams (11-25% imperviousness), and non-supporting streams (>25% imperviousness). A fourth designation is given to impacted or non-supporting streams for streams that have potential to be restored/rehabilitated to the next best classification level (e.g., move from a non-supporting designation to an impacted designation). The reader is referred to *Rapid Watershed Planning Handbook* for a more detailed discussion of the impervious cover model (CWP, 1998).

Using rapid watershed diagnostic techniques such as the impervious cover model and other field assessment protocols (e.g., The Rapid Stream Assessment Technique and The Rapid Geomorphic Assessment) translates into time and money savings that facilitates more rapid implementation of management strategies.

The rapid approach is in contrast to how many past watershed planning efforts have occurred. All too often, communities find that some of their past watershed planning efforts have not always protected local water resources adequately, i.e, measurably reduced the cumulative impacts of watershed development over the long run. The failure of many watershed planning and implementation studies can often be attributed to factors such as:

- **Plan is conducted at too great a scale** – the focus becomes too vague; too many subwatersheds are considered; impact sources are often impossible to identify; too many stakeholders are involved and implementation responsibility is diminished; monitoring and implementation costs skyrocket; and non-urban sources confound protection efforts

- **Plan is a one-time study rather than a long-term and continuous management commitment** – plan does not fully commit resources and authority to a long-term process and after a period of time the report and recommendations are lost to competing priorities

- **Plan lacks local ownership and key stakeholder involvement in the watershed management process** – responsibility is handed off to consultants or technical staff; internal consensus and support are not generated and few stakeholders are involved in the process; consensus and support are not provided for elements which may be controversial

- **Budget for watershed plan is insufficient** – plan scope is too broad and ambitious for available funds; baseline mapping and monitoring often exhausts budget with little left for management process, stakeholder involvement, or implementation

- **Plan recommendations are too general** -- recommendations often general as in: better erosion and sediment control (ESC), need for better agency coordination, wider use of stormwater treatment practices, or need for long term watershed monitoring, with no specifics on how to fund programs, what ordinances will require wider use of stormwater treatment practices or ESCs, where and how to construct specific stormwater treatment practices or stream rehabilitation projects, how to achieve better agency coordination, or how and when to conduct monitoring; management recommendations do not assign resources, responsibilities and timetables

The Watts Branch Watershed Plan was developed to avoid these pitfalls. The basic approach of rapid watershed planning is to make management decisions based on the amount of current and projected future impervious cover to achieve realistic and measurable goals. In particular, the broad goals of the Watts Branch Watershed Plan are that it be:

- **Scientifically credible** based on the best science that is available;

- **Democratic** in that a group of real citizens and watershed interest groups can help prepare

- them;

- **Effective** such that we are reasonably confident that we can achieve the water resource goals set for the watershed if the plan is fully implemented;

- **Locally-based** with a strong focus on the smaller subwatersheds that contain headwater streams;

- **Economically defensible** so that the needs for economic growth are balanced against the benefits of watershed protection;

- **Rapid**, since development can occur very rapidly, it is possible to dramatically change watershed quality in a few decades. Therefore, a brief planning phase should quickly lead to on the ground implementation of specific management tools with a 2-year time frame.

## 1.7 Stormwater Retrofitting and Stream Rehabilitation

Most urban watersheds such as Watts Branch are already impacted to some degree and often have little or no existing stormwater controls. In these types of watersheds, planning is generally focused on existing impacts, as opposed to being protection or conservation oriented. Managers are faced with the prospect of addressing problem areas. Common mitigation approaches are to implement stormwater retrofits and stream rehabilitation practices.

Retrofits are structural stormwater management measures for urban watersheds designed to help minimize accelerated channel erosion, reduce pollutant loads, promote conditions for improved aquatic habitat, and correct past mistakes. Simply put, these stormwater treatment practices are inserted in an urban landscape where little or no prior stormwater controls existed.

Stream rehabilitation practices can include riparian reforestation, wetland creation and enhancement, habitat creation, and streambank stabilization. For the Watts Branch study, the stream rehabilitation focus is primarily on opportunities for streambank stabilization using both “hard” or structural practices and bioengineering practices (practices that employ live vegetation).

Retrofits and stream rehabilitation practices come in many shapes and can address flood control, channel protection, and water quality treatment. Usually at least some kind of practice can be installed in almost any situation. But fiscal restraints, pollutant removal capability, and watershed capture area must all be carefully weighed in any retrofit selection criteria.

Stormwater retrofits and stream rehabilitation practices should be applied along with other available watershed rehabilitation tools for reducing pollutants and restoring habitat as part of a watershed rehabilitation program. Some of the many watershed rehabilitation strategies include:

- Improving aquatic habitat within urban streams
- Replacing or enhancing riparian cover along urban streams
- Promoting pollution prevention source controls within the watershed
- Recolonizing streams with native fish communities

Many, if not most, of these tools should be planned in conjunction with an urban retrofit and stream rehabilitation program, and rarely should be considered without one. Without establishing a stable, predictable hydrologic water regime which regulates the volume, duration, frequency, and rate of stormwater flow, many of these other tools may be disappointing failures. To successfully improve the overall aquatic health of an urban stream, stormwater retrofitting and stream rehabilitation are essential elements.

Retrofitting and stream rehabilitation can be daunting tasks, and usually expensive ones. The key to a successful program is to follow a systematic and straightforward process toward implementation. Retrofitting and stream rehabilitation is still more of an art than a science, and planners and designers who take an approach geared toward innovation will go a long way towards successfully planning, designing, and building stormwater retrofit and stream rehabilitation projects. Section 3 details the stormwater retrofit inventory that was conducted as part of the Watts Branch study, where 37 sites were identified as possible candidates for stormwater quantity and/or quality retrofits. The sites were prioritized using a ranking system (see Section 3), and detailed concept plans were prepared under Phase II of this project for the highest ranking sites. Section 4 details the stream rehabilitation inventory that was conducted. Thirty-five stream sites were identified as candidates for improvements. Priority sites were also selected for detailed concept plans under Phase II of the project.

## 1.8 Scope of Study

As previously mentioned, the Center's approach to developing a watershed management plan for Watts Branch employs the principles of a rapid approach, coupled with an emphasis on "stakeholder" involvement to produce a workable plan for implementation of specific management measures.

The planning process consisted of three phases of development: a watershed assessment stage, a conceptual design stage, and an implementation stage. In the assessment stage, the project team documented existing conditions within the watershed. Tasks included:

- A stream geomorphic assessment to assess the dynamic stream evolutionary process associated with altered urban hydrology
- A biological, physical and chemical stream survey to identify overall stream health and identify specific problem areas
- identification of potential stream rehabilitation and candidate stormwater retrofit opportunities within the basin
- A watershed planning charette to engage stakeholders in the watershed planning process, and
- Preparation of initial recommendations for employing management measures

In the second phase, the project team prepared conceptual designs, cost estimates and analyses of estimated benefits for specific management measures such as stormwater management retrofits, stream rehabilitation, wetland enhancement, and forest conservation.

In the third phase, the project team developed management recommendations for public outreach and education, bench mark and long term monitoring, and prioritization of implementation.

### 1.9 Watts Branch Partnership and Stakeholders

In a real sense, every current and future resident of a watershed is a stakeholder, even though they may be unaware of this fact. Watershed stewardship programs can increase awareness and broaden community support to implement watershed plans. The ideal group of stakeholders for designing a subwatershed plan are determined by the level of interest of local parties in water quality and resource protection issues. The list of non-agency and agency stakeholders in the Watts Branch Watershed Study are listed in Table 1.3.

**Table 1.3 Stakeholders in the Watts Branch Watershed Management Process**

| Non-agency Stakeholders | Agency Stakeholders |
|---|---|
| Homeowners Association(s)<br>Citizen Associations<br>Watts Branch Partnership<br>Developers (e.g., King and Thomas Farms)<br>Watershed Property Owners<br>Business Interests (industrial, commercial business owners)<br>Gas, Oil and Utility Companies<br>Montgomery College<br>Lakewood Country Club | Rockville Parks and Recreations Departments<br>Rockville Public Works Department<br>State and Federal Regulatory Agencies<br>MDE/WMA |
| Note: See section 2.5 for discussion on representative stakeholder involvement to date. | |

The Watts Branch project approach was structured in a way to involve the public at various levels throughout the course of the project. The project approach placed an emphasis on getting input and involvement from the public early in the planning process. This allowed for contentious issues to be identified and addressed early in the planning phases and helped to identify what the important issues are to watershed residents. Establishing stakeholder pride and ownership in the plan leads to a greater chance of project success. The project scope has been developed to ensure that public involvement and participation remains a component of the watershed plan well after the immediate project.

The City's Watts Branch staff team formed the Watts Branch Partnership in September 1998 as a citizen-based advisory group to actively participate in the project. Homeowners and civic associations from the City's portion of the Watts Branch watershed were invited to send representatives. Ultimately, the majority of the associations within the study area participated over the course of the study. Members also included environmental group representatives and other interested residents. The Partnership members reviewed and commented on the scope of the study and consultant selection. The Partnership also attended several educational sessions to better understand urban stormwater management and stream protection, as well as the overall condition of the Watts Branch watershed. During the Phase I planning, the Partnership was heavily involved in the stormwater retrofit and stream stabilization project ranking and selection. In Phase II, the

Partnership reviewed each of the stormwater and stream concepts, and offered comments on elements important to residents, such as, appearance and landscaping, effects on recreation space, and trail connections. Many of the comments and concerns of the residents resulted in concepts that better fit the neighborhood goals. Specific components of the public involvement approach are described below.

A planning charette was held early (October 1999) in the planning process with interested stakeholders (see Section 2.5 for a summary of the charette), in which the preliminary findings of the stream assessment and retrofit and stream rehabilitation inventories were presented. The stakeholders participated in actual watershed exercises, such as setting realistic goals for the watershed plan, proposing alternative retrofit and stream rehabilitation sites, and making recommendations for a pollution prevention outreach and public education program.

City staff and the Center attended several civic association meetings or neighborhood meetings to explain the watershed study and local projects. The City used multiple forms of media to educate and inform the citizens about the project, including its cable TV station, a monthly City publication, signage posted in the neighborhoods, as well as direct mailouts. Much of the Phase I and II work culminated in two open houses held by the City which highlighted the project and provided detailed presentations of the priority stormwater retrofit and stream rehabilitation sites. City and Center staff were on hand to address and record comments and questions.

City and Center staff also discussed individual projects with appropriate state and federal agencies to review potential permit requirements and other environmental considerations. A number of stormwater management and stream stabilization projects will require permits for wetland or stream disturbance. These conceptual projects were presented to the Wetland Coordinating Committee, which includes representatives from Maryland Department of Environment, Maryland Department of Natural Resources and the Army Corps of Engineers, as well as Maryland-National Capital Park and Planning Commission and Montgomery County Department of Environmental Protection and Department of Permitting Services. Maryland's State Highway Administration was contacted regarding projects within the I-270 right-of-way. City staff also contacted and met with private land owners who had projects proposed on their property, such as Lakewood Country Club.

As a separate component of this project, a pollution prevention and public education program outline was prepared documenting and highlighting the behaviors most critical to modify and identifying specific strategies for modifying these behaviors. Media outreach techniques that have been identified as the most effective ways to influence these behaviors were identified. The guidance provided for developing a public outreach and education program will be instrumental to fostering a strong public involvement in the protection and upkeep of Watts Branch as well as other Rockville watersheds.